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31085

International application No.
PCT/FI99/00185

INDICATIONS RELATING TO DEPOSITED MICROORGANISM OR OTHER BIOLOGICAL MATERIAL

(PCT Rule 13bis)

A. The indications made below relate to the deposited microorgani	ism or other biological material referred to in the description
on page 55 , line S 1	4, 15 and 16
B. IDENTIFICATION OF DEPOSIT	Further deposits are identified on an additional sheet
Name of depositary institution	·
DSMZ-Deutsche Sammlung von Mikroorga	anismen und Zellkulturen GmbH
Address of depositary institution (including postal code and country	<i>(ינ</i>
Mascheroder Weg 1b, D-38124 Braunsch	weig, Germany
Date of deposit	Accession Number
5 March 1999	DSM 12722, DSM 12723, DSM 12724
C. ADDITIONAL INDICATIONS (leave blank if not applicable	This information is continued on an additional sheet
been refused or withdrawn or is deemed to be w	opean patent or the corresponding information way or until the date on which the application has rithdrawn, only by the issue of such a sample to an da) or the person requesting the sample (Rule 28(4))
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INDICATIONS RELATING TO DEPOSITED MICROORGANISM OR OTHER BIOLOGICAL MATERIAL

(PCT Rule 13bis)

A. The indications made below relate to the deposited microorgan on page $\underline{55}$, line S $\underline{1}$	nism or other biological material referred to in the description 4, 15 and 16			
B. IDENTIFICATION OF DEPOSIT	Further deposits are identified on an additional sheet			
Name of depositary institution				
DSMZ-Deutsche Sammlung von Mikroorga	anismen und Zellkulturen GmbH			
Address of depositary institution (including postal code and count	מי			
Mascheroder Weg 1b, D-38124 Braunschv	weig, Germany			
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International application No. PCT/F199/00185

INDICATIONS RELATING TO DEPOSITED MICROORGANISM OR OTHER BIOLOGICAL MATERIAL

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A. The indications made below relate to the deposited microorgan on page55, line S1	ism or other biological material referred to in the description , 12 and 13
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4 June 1998	DSM 12213, DSM 12214, DSM 12215
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Date of deposit	Accession Number			
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INDICATIONS RELATING TO DEPOSITED MICROORGANISM OR OTHER BIOLOGICAL MATERIAL

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Name of depositary institution	
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EPC and the corresponding regulations in Canada	pean patent or the corresponding information ay or until the date on which the application has hdrawn, only by the issue of such a sample to an a) or the person requesting the sample (Rule 28(4) a, Iceland and Norway).
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B. IDENTIFICATION OF DEPOSIT	24 and 25
Name of depositary institution	Further deposits are identified on an additional sheet
DSMZ-Deutsche Sammlung von Mikroorga	anismen und Zellkulturen GmbH
Address of depositary institution (including postal code and coun	lry)
Mascheroder Weg 1b, D-38124 Braunschv	veig, Germany
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INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification 6:

C12N 1/19, 1/21, C12P 7/10, 7/42, 13/08

(11) International Publication Number:

WO 99/46363

(43) International Publication Date: 16 September 1999 (16.09.99)

(21) International Application Number:

PCT/FI99/00185

A1

(22) International Filing Date:

11 March 1999 (11.03.99)

(30) Priority Data:

980551

11 March 1998 (11.03.98)

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(72) Inventors; and

- (75) Inventors/Applicants (for US only): ARISTIDOU, Aristos [CY/FI]; Takojantie 1 N, FIN-02130 Espoo (FI). LONDES-BOROUGH, John [FI/FI]; Jääkärinkatu 9 A 15, FIN-00150 Helsinki (FI). PENTTILÄ, Merja [FI/FI]; Vattuniemenkatu 2 A 22, FIN-00210 Helsinki (FI). RICHARD, Peter [DE/FI]; Mannerheimintie 51 A 10, FIN-00250 Helsinki (FI). RUO-HONEN, Laura [FI/FI]; Runeberginkatu 35 A 9, FIN-00100 Helsinki (FI). SÖDERLUND, Hans [FI/FI]; Salonkitie 19, FIN-02940 Espoo (FI). TELEMAN, Anita [SE/SE]; Belestigen 11, S-182 64 Djursholmen (SE). TOIVARI, Mervi [FI/FI]; Kukkumäenkuja 12 as 1, FIN-02280 Espoo (FI).
- (74) Agent: OY JALO ANT-WUORINEN AB; Iso Roobertinkatu 4-6 A, FIN-00120 Helsinki (FI).

(81) Designated States: AE, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, US, UZ, VN, YU, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SL, SZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).

Published

With international search report.

Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments.

With an indication in relation to deposited biological material furnished under Rule 13bis separately from the description.

- (54) Title: TRANSFORMED MICROORGANISMS WITH IMPROVED PROPERTIES
- (57) Abstract

The present invention relates to genetic engineering of production microorganisms used in biotechnology to improve their properties so that they produce useful products more efficiently. The microorganisms express at least one enzyme that causes the functional coupling of the oxidation and reduction of substrates by two pyridine nucleotide-linked dehydrogenase reactions with different specificities for the NAD/NADH and NADP/NADPH coenzyme couples and so facilitates the transfer of electrons between the two coenzyme couples through the said substrates. In particular the invention relates to increasing the yields of products such as ethanol or amino acids from carbon and nitrogen sources such as biomass comprising hexoes, pentoses or their polymers.

INTERNATIONAL SEARCH REPORT

International application No.

PCT/FI 99/00185

A. CLASSIFICATION OF SUBJECT MATTER

IPC6: C12N.1/19, C12N 1/21, C12P 7/10, C12P 7/42, C12P 13/08 According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC6: C12N, C12P

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE, DK, FI, NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

BIOSIS, MEDLINE, WPI

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	Microbiology, Volume 142, 1996, Nina Meinander et al, "A heterologous reductase affects the redox balance of recombinant Saccharomyces cerevisiae", page 165 - page 172, see esp. fig 3 and table 2	1-38
		·
A	EP 0733712 A1 (AJINOMOTO CO., INC.), 25 Sept 1996 (25.09.96)	1-38
		
A	WO 9742307 A1 (PURDUE RESEARCH FOUNDATION), 13 November 1997 (13.11.97)	1-38
		
		

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Date of the actual completion of the international search

Date of mailing of the international search report

9 June 1999

Name and mailing address of the ISA/ Swedish Patent Office

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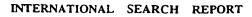
International application No.

PCT/FI 99/00185

		ent document in search repor	t	Publication date		Patent family member(s)	Publication date
E	EP		A1	25/09/96	AU AU BR JP PL SK US CA CN CZ HU	687458 B 8002694 A 9407907 A 4324737 A 314090 A 53796 A 5830716 A 2175042 A 1139956 A 9601213 A 74840 A	26/02/98 22/05/95 26/11/96 13/11/92 19/08/96 01/10/96 03/11/98 04/05/95 08/01/97 11/09/96 28/02/97
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International application No. PCT/US97/07663

B. FIELDS SEARCHED

Electronic data bases consulted (Name of data base and where practicable terms used):

APS, Dialog files 301, 155, 5, 351 (Chemname, Medline, Biosis, Derwent WPI) search terms: Xyulokinase, xylose reductase, xylitol dehydrogenase, vector?, plasmid?, (ribosom? or 18Sor 28S(3n)(gene? ? or chromosom? or locus or loci or cistron), integrat?, insert?, yeast, Saccharomyces, Candida, Pichia, Pachysolen, ferment? degrad?, xylose, nonselect?

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International application No. PCT/US97/07663

	, PC170S97/0	
C (Continue	ation). DOCUMENTS CONSIDERED TO BE RELEVANT	·
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X Y	FUJII et al. Application of a Ribosomal DNA Integration Vector in the Construction of a Brewer's Yeast Having α -Acetolactate Decarboxylase Activity. Applied and Environmental Microbiology. April, 1990. Vol. 56. No. 4, pages 997-1003, entire document.	14-16, 18- 19, 28, 30 1-13, 17, 20-27, 29
Y	TANTIRUNGKIJ et al. Fed-batch fermentation of xylose by a fast-growing mutant of xylose-assimilating recombinant Saccharomyces cerevisiae. Applied Microbiology and Biotechnology. 1994. Vol. 41. No.1. pages 8-12, entire document.	1-29
Y	TANTIRUNGKIJ et al. Genetic Improvement of Saccharomyces cerevisiae for Ethanol Production from Xylose. Ann. N. Y. Acad. Sci. 02 May 1994, Vol. 721, pages 138-147, entire document.	1-29
Y	WO 95/13362 A1 (PURDUE RESEARCH FOUNDATION) 18 May 1995. entire document.	1-29
X Y	LOPES et al. Factors affecting the mitotic stability of high copy number integration into the ribosomal DNA of Saccharomyces cerevisiae. Yeast. 1996. Vol. 12. pages 467-477, entire document.	14-16, 18-19, 28, 30 1-13, 17, 20-27, 29



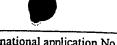
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INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference 31085	FOR FURTHER ACTION	see Notification of Transmittal of International Search Report (Form PCT/ISA/220) as well as, where applicable, item 5 below.				
International application No.	International filing date	e (day month year)	(Earliest) Priori	ty Date (day month year)		
PCT/FI 99/00185	11 March 1999		11 March 19	998		
Applicant						
Valtion teknillinen tutki	muskeskus et al					
This international search report has applicant according to Article 18. A	been prepared by this In copy is being transmitted	ternational Searchi d to the Internation	ng Authority and al Bureau.	I is transmitted to the		
This international search report con	sists of a total of3	_ sheets.				
X It is also accompanied by a	a copy of each prior art of	document cited in t	his report.			
1. Certain claims were found	unsearchable (See Box I)					
2. Unity of invention is lacking	g (See Box II).					
3. The international application international search was careful.	on contains disclosure of arried out on the basis of	a nucleotide and/o the sequence listing	r amino acid sequ	uence listing and the		
	filed with the internationa	al application.				
	furnished by the applicant separately from the international application,					
·	but not accommatter going l	npanied by a staten beyond the disclosu	nent to the effect are in the internat	that it did not include tional application as filed.		
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1	the text has been establis	hed by this Author	ity to read as foll	ows:		
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	the text is approved as su			hic Authority as it appears		
 	the text has been establish in Box III. The applicant national search report, su	may, within one n	onth from the da	his Authority as it appears ate of mailing of this inter-		
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6. The figure of the drawings to be	e published with the absurance as suggested by the appli		Γx	None of the figures.		
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International application No. PCT/FI 99/00185

Box III TEXT OF THE ABSTRACT (Continuation of item 5 of the first sheet)

The present invention relates to genetic engineering of production microorganisms used in biotechnology to improve their properties so that they produce useful products more efficiently. The microorganisms express at least one enzyme that causes the functional coupling of the oxidation and reduction of substrates by two pyridine nucleotide-linked dehydrogenase reactions with different specificities for the NAD/NADH and NADP/NADPH coenzyme couples and so facilitates the transfer of electrons between the two coenzyme couples through the said substrates. In particular the invention relates to increasing the yields of products such as ethanol or amino acids from carbon and nitrogen sources such as biomass comprising hexoses, pentoses on their polymers.

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